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P A P E R S  
IN  
*AGRICULTURE*  
AND  
*RURAL ECONOMY.*

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Nº I.

RECLAIMING WASTE MOOR LAND.

*The LARGE GOLD MEDAL, the premium offered, was this Session presented to J. PEART, Esq., of SETTLE, for RECLAIMING FIFTY-SIX ACRES OF WASTE MOOR-LAND. The following communications have been received from the Candidate on the subject.*

SIR;

Settle, Nov. 30th, 1820.

**I** TAKE the liberty of requesting you will lay before the Society of Arts, Manufactures and Commerce, the following account of the improvement of fifty-six acres, three roods, and twenty-five perches of land, statute measure, lying waste and uncultivated, and the expenses attend-

ing such improvement, and for which I beg to offer my claim for their Gold Medal.

Having many complaints by labourers in husbandry, of the want of work, I was induced to give employment to those who applied for it, by cultivating two parcels of waste ground, the one being at Grassington, called New Pasture Allotment, and containing forty acres and two roods, and the other near Ingleton, called Bastongill, containing sixteen acres, one rood, and twenty-five perches.

The land at Ingleton was of the worst quality I have ever yet seen attempted to be cultivated, being a short ling, on a black, barren, turbary soil; that at Grassington was covered with a strong ling on turf earth, with yellow soil under the turf. The situation of this land being too high for crops of corn, I have endeavoured to convert it into grass land, and in a way different from any which I have yet seen tried, and though the plan I have adopted has been very expensive, I am inclined to think it will answer better, by the increased expense, than any I have seen practised. The usual way of improving this sort of land for grass (where its situation is too high for crops of corn) has been, either by ploughing, or by paring and burning; or paring only, and then (after draining such parts as required it), sowing it with grass seeds, and liming it on the surface. The objections to this practice are, that the old sward has not been completely destroyed, but has grown in the seams, and the surface by ploughing not being made level, a great part of the lime has fallen into the seams, and a considerable part of the surface of the land remained uncovered with lime.

The plan I have pursued on the above parcels of land was, first to burn the ling, where it was strong, then

to grave the land with spades ; after that was done, I caused the whole surface to be made perfectly level, by cutting it with sharp spades, then had it limed, and sown with grass seeds, grown in the neighbourhood, and white Dutch clover seed ; part of the land was sown with seeds before the lime was spread, and the remainder was sown after the lime was spread on the surface. The advantage of graving was, getting the ground turned up deeper than if it had been ploughed, and bringing up a little yellow soil, which generally lies underneath the turf, and which tends to make the land firmer, and more congenial to the growth of grass seeds than turf soil, and also getting a much more level surface. As I attach much importance to the land being made very level on the surface, previous to the grass-seeds being sown, I was induced to have the whole of this land levelled by persons at days wages, as I hardly knew what it deserved by piece work ; and if I had let it by the acre, I feared it might not have been done to my satisfaction. I have laid a much greater quantity of lime, and sown a greater quantity of grass-seeds on this land, than I ever before saw practised ; and though the expense has been very great, I have no doubt, from the present appearance of the land, the seeds being in a flourishing state, but it will answer a profitable purpose, my opinion being, that the land will in two years fatten any sort of cattle, and be worth to rent from twenty-five shillings, to thirty shillings an acre, and in its unimproved state, it was not, on an average, worth more than three shillings an acre. The land is in my own possession, and it is my intention to buy cattle upon it, and sell them from it, in order to ascertain what profit it will make, and thereby know the advantage resulting from this experiment.

On the land at Grassington, there were a great many lead-

mine hillocks, which I caused to be led away, and spread on the blackest earth, which will tend to make the turbary land more firm and stiff.

There are millions of acres of this sort of land in the kingdom, and therefore, it appears to me of importance to find out the best method of bringing this sort of land into grass land, in situations where it is too high for corn; for the most valuable grasses grow well in the highest climates, and in pasturing land, it is not of much importance that there are any buildings on the land, or that it is near a town or village.

In the annexed paper, marked No. 1, is a particular of the expenses of improving the land at Grassington, which contains 40 acres, 2 roods, and a Certificate, signed by Mr. Bentham, the curate of the parish of Linton, in which parish Grassington is situate, of his belief, that the statement is correct; and there is also the Certificate of Emanuel Lawson, who constantly superintended, on my behalf, the improvements on that parcel of land; and in the annexed paper marked, No. 2, is a particular of the expenses of improving the land at Ingleton, containing 16 acres, 1 rood, and 25 perches, and a Certificate, signed by Mr. Waller, the incumbent curate of Ingleton, of his belief, that this statement is correct, and I also hereby certify, that both those statements are accurate and correct,

I am, Sir,

*A. Aikin, Esq.,*  
*Sec. &c. &c.*

*&c. &c. &c.,*

JOHN PEART.

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No. 1.—AN Account of money paid by John Peart of Settle, in the county of York, between the first of November, 1819, and the 12th November, 1820, for improving a

parcel of land lying waste and uncultivated, being peat earth, and covered chiefly with strong ling; called New Pasture Allotment, containing 40 acres, 2 roods, statute measure, and situate at Grassington, in the parish of Linton, in the county of York.

Paid to sundry persons, for graving with spades 40 acres, 2 roods, of land, at from 2 guineas to 2 <i>l.</i> 5 <i>s.</i> per acre . . . . .	93	3	0
Paid to sundry persons, for days works for levelling the land with sharp spades, after it was graven, at from 2 <i>s.</i> to 3 <i>s.</i> per day . .	66	13	1
Paid for building a lime-kiln on the land . .	8	0	0
Paid for 1,504 bushels of hay-seeds grown in the neighbourhood, sown on the graven land, at from 9 <i>d.</i> to 11 <i>d.</i> per bushel . . . . .	61	6	7
Paid for 236 pounds of white Dutch clover seed, sown on do. . . . .	12	2	0
Paid Joseph Tomlinson, for cutting, walling, and filling 578 rods of stone drains, at 13 <i>d.</i> per rod, of seven yards . . . . .	31	6	2
Paid do. for cutting, walling, and filling, 300 rods of do. at 15 <i>d.</i> per rod . . . . .	18	15	0
Paid William Lambert for 7,899 loads of lime (each load being three bushels), laid on the graven land, at 7½ <i>d.</i> per load . . . . .	246	6	10
Paid for leading the lime from the kiln . .	31	4	11
Paid for spreading the lime on the land . .	8	17	0
	<hr/>		
	£. 574	11	7
	<hr/>		

## CERTIFICATES.

I, the Rev. John Bentham, curate of the parish church of Linton, in which parish the above mentioned land is situate, do hereby certify, that I know the above-named John Peart, and believe the above account to be true. Witness my hand, this 22nd day of November, 1820.

JOHN BENTHAM.

I, Emanuel Lawson, of Threshfield, in the parish of Linton, who superintended on the part of the said John Peart, the improvements above-mentioned, do hereby certify, that the above account is true. Witness my hand, this 22nd day of November, 1820.

EMANUEL LAWSON.

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No. 2.—AN account of money paid by John Peart, of Settle, in the county of York, banker, between the 1st of November, 1819, and the 12th November, 1820, for improving a parcel of land lying waste and uncultivated, being peat earth, and covered, previous to its improvement, chiefly with short ling, called Bastongill, containing 16 acres, 1 rood, 25 perches, statute measure, and situate within the township of Ingleton, in the county of York.

Paid Foster & Co., for graving with spades,	£.	s.	d.
16 acres, 1 rood, 25 perches, at 3 <i>l.</i> 6 <i>s.</i> per			
acre . . . . .	54	4	9
Paid for days work for levelling the land			

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with sharp spades after it was graven, at from	£.	s.	d.
2s. to 2s. 6d. per day . . . . .	23	8	3
Paid Spedding & Co., for cutting, walling, and filling, 310 rods of stone drains, at 14d. per rod, of 7 yards . . . . .	18	1	8
Paid for 1,160 bushels of hay seeds, grown in the neighbourhood and sown on the graven land, at from 8d. to 10d. per bushel . . .	48	4	6
Paid for 140 pounds of white Dutch clover seed, sown on this land . . . . .	7	4	0
Paid for days work for sowing the above seeds	1	17	6
Paid for leading loose stones from the land .	1	17	0
Paid for 2,410 loads of lime (each load con- taining 3 bushels), laid on the land at 9½ per load . . . . .	95	7	11
Paid for spreading the lime, at 2s. 6d. per hundred load . . . . .	2	15	3
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	£.253	0	10
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## CERTIFICATE.

I, the Rev. William Waller, curate of the chapel of Ingleton, in which chapelry the above land is situate, do hereby certify, that I know the above-named John Peart, and believe the above account to be true. Witness my hand, this 20th day of November, 1820.

WILLIAM WALLER, B. D., *Incumbent Curate  
of Ingleton.*



*Extract of a Letter from MR. PEART.*

Settle, November 28th, 1821.

I HAVE now to observe, that the improvements described in my former communication, are fully answering my expectations, the land being now covered with a rich sward, and the sheep which were this year put upon it, were made very fat. I have every reason to believe that the land stated to be improved, will next year fatten 20 Scot heifers, and 50 ewes with their lambs ; and I think it the best and greatest improvement I have seen on this sort of land, and much superior to ploughing, which is the plan usually adopted.

N<sup>o</sup> II.

## ENGLISH OPIUM.



*The premium of THIRTY GUINEAS was this Session presented to Messrs. COWLEY and STAINES, Surgeons, of Winslow, Bucks, for cultivating FOUR ACRES OF THE WHITE POPPY (*Papaver somniferum*), and extracting therefrom, 60 lbs. of SOLID OPIUM, equal to the best Turkey Opium. The following communication has been received from the Candidates; and specimens of the Opium, of the Poppy-seed, and of the Oil, together with the implements employed in the cultivation of the plants, and extraction of the Opium, have been placed in the Repository of the Society.*

SIR;

Winslow, Bucks.

IN consequence of a premium being offered by the Society for Encouraging Arts, Manufactures, and Commerce, for the cultivation of the *papaver somniferum*, for opium, we are induced to communicate an account of our experiments on that plant, for the perusal of the Society.

Reading of the method employed in the year 1794, by Mr. Ball, of Willison, and perceiving that it had received the approbation of the Society, we became desirous of trying his process, and did so on a small scale, in several seasons; but although we never failed to produce excellent opium, there appeared no prospect of enlarging the scale of our operations with advantage, chiefly on account of the great difficulty and expense, which attended the operation of properly scarifying the poppy head. The discovery of an error in Mr. Ball's calculations, gave us additional discouragement; that gentleman states the produce of an acre to be 50 lb., supposing a square foot to produce one grain, whereas, on that calculation, it would only amount to between five and six pounds.

In the year 1819, we contrived the scarificator (Plate 1, fig. 1), and were so much encouraged by the increased facility afforded by its operation, as to undertake 15 poles of poppies. This little piece was selected from six acres of poppies, on account of bearing a very regular crop. It afforded employment to two women, for 9 days, who received 1s. per day, which made the expense of collecting, &c., 12s. per lb., as they procured one pound and a half of solid opium, of which we inclose a specimen. The cultivation was similar to that pursued in the two following years, we need not therefore particularize it, until we describe our progress in the year 1821. The only peculiarity was, a very fine season throughout.

In 1820 we constructed the scarificator (fig. 2), which was employed on 1 acre, 5 perches, of poppies, and was found much superior to our first contrivance, both in facility of application, and in dispatch. The process was begun, July 19, and finished August 2, producing 21*lb.*, 8*oz.*, 2*dr.*, of opium, in the recent state; which was

reduced, by evaporation, to 15*lb.*, 5*oz.*, 6*drs.* (avoir-dupois) of solid opium, a specimen of which accompanies this communication. The crop was pretty perfect, but the people were hindered by frequent showers. The table, No. 1, will explain their daily progress and expense.

We will now endeavour to describe minutely, the cultivation and process employed last year.

In the beginning of February, 1821, a field measuring 4 acres, 1 rood, 35 perches, exclusive of fences, &c., which had borne two successive crops of poppies, and had received a ploughing immediately after the removal of the last, in the preceding Autumn, was ploughed a second time, and sown with seed of the *papaver somniferum*, between the 10th and 15th; the seed was the growth of the preceding year, and was drilled with 21 inch intervals. It came up by March 14th, and held out the promise of a full crop until the beginning of April, when some remarkably heavy showers of rain occurred, which made the crop extremely imperfect, intervals of from one, to twenty yards appearing all over the field. One acre was patched with potatoes, and the remainder with Swedish turnips; the former did very well, but the latter were destroyed by the fly, excepting a small residue, which was drawn in July, and transplanted, to fill up a crop of Swedes a mile distant; which, though more fortunate than these patches, had yet suffered severely from the same cause.

The intervals between the drills were hoed by the first week in May. This operation was found to require much care, in consequence of the immense number of annuals with which the land was infested. The difficulty was much diminished when the distinctive characters of the *papaver somniferum*, became familiar to the new labourers. These were soon able to distinguish the poppies from all

the weeds which bore a general resemblance, excepting the *papaver rhæas*, which puzzled them a good while. It should be observed, that the difficulty was owing, in a great measure, to the imperfection of the crop; where that was good, it derived from continuity, a character, by which it was sufficiently distinguished from the surrounding weeds.

This hoeing was best performed by the hoe, figs. 3 and 4. The common hoe was found highly objectionable; it buried the very minute poppies with mould, which the other permitted to pass through; the weeds too, were very small, and more easily destroyed by merely cutting them below their seminal leaves, than by deeper hoeing.

The poppies were next set out with the hoe, figs. 5 and 6; two boys being allowed to each hoer to pull up weeds and supernumerary poppies, to which the hoe could not be applied. The affixed paddle was found of great service in removing weeds from the off side of the row.

A space of 4 inches from plant to plant, was deemed most advantageous, because, although heads as large and as numerous might be obtained by separating the plants to a foot apart, yet their situation would be more perilous, when strong winds happened, because such weather usually, either roots up the plant, or breaks the stem just above the earth, and neither the root nor stem of a poppy loaded with six heads, are supposed to possess double the strength of one bearing three.

The setting out was finished by the latter end of May, after which, no difficulty was experienced in the management of the crop, nor any expense beyond what would have been incurred by keeping a crop of drilled beans equally clean on the same land. The hoeing was afterwards performed at 2s. per land; this, with hand weeding,

amounted to about 5s. per acre; it was repeated three, and in some parts four times after the plants were set out.

The poppies having flowered, and generally lost their petals were observed to be covered with a blueish white bloom. We had before decided, that this appearance was the proper criterion of the best time for commencing the process for extracting the opium.

Without waiting until the whole crop was ready, the operation was commenced, July 24th, in the following manner: each person was provided with a scarificator, fig. 2; a knife, fig. 7; and a receiver, fig. 8; a row was then appropriated to each person, who was directed to take a poppy head in the left hand, and twisting it towards the right, to apply the scarificator with the right hand, so as to make the incisions in a horizontal direction, near the top of the head, and to a third part of the extent of its circumference in a sunny aspect.

Twisting the head was found to expedite the operation by dividing the motion between the right hand, and the poppy, by the return of the latter to a natural position. Horizontal wounds were preferred, as tending most to retain the juice until it became coagulated, which in warm weather was effected in about 20 minutes after it had exuded. Still, drops would fall to the ground from some of the heads; to remedy this as much as possible, the incision was made near the top of the head, and the sunny aspect given to the first incision, as the most important to be early secured. The best workers were placed first, as much mischief was found to result from permitting them to pass each other, their clothes wiping the opium from their neighbours' rows.

In this manner they proceeded about two hours, when the opium which had first exuded, was found to have

acquired consistence enough to admit of being scraped off. About three-fourths of the people were then employed to scrape off the opium with their knives, occasionally transferring it to their receivers, which were tied round the waist. The scarifiers in the meantime pursuing their work, until the approach of evening or apprehension of rain, rendered it desirable to employ the whole party to finish the scraping.

In this manner, the whole piece was treated, when another incision was formed in continuation of the first, and of similar extent, the circle being completed by the third incision; when a second series was commenced just below the first, and conducted in the same manner.

This description applies to the work of the more careful people, for the novelty of the employment was, to some, a source of some little confusion. No inconvenience resulted, provided the whole row was scarified in one aspect, otherwise the scraper was extremely apt to pass many heads unnoticed.

The poppies were found to produce opium freely, until the third or fourth incision, when the quantity was observed to diminish rapidly. Nevertheless, many continued to bleed freely even to the tenth incision, proving that the poppy has the power of secreting this peculiar liquid from its common juices. This opinion is confirmed by the fact of the plant continuing to furnish opium twice as long in a wet, as in a dry season.

The opium was weighed daily, and the process continued until the produce at an estimate of 30s. per pound, would no longer replace the expense. For the daily collection, and weekly expense, *vide Table 2*.

The opium which had daily accumulated in a 12 gallon pan, was now found to weigh 97*lb.* 1*oz.* It was well stirred,

and evaporated in 4 large tin vessels which were placed in the sun, and occasionally moved, so as to keep the bottoms perpendicular to his rays. Two women were constantly employed to stir the surfaces which was necessary to break the film which was constantly formed either by evaporation, or absorption of oxygen from the atmosphere.

When the opium was found to be sufficiently exsiccated, it was formed into balls, as large as cocoa nuts, and then rolled in dried poppy leaves, when the weight of it was 60*lb.* 1*oz.* 4*dr.* a sample of this is inclosed.

The poppies were suffered to stand until the stalk, near the head, began to turn yellow, this was known to indicate a sufficient, though not very complete maturity of the seed. They were pulled with the root, on the 18th of August, and laid flat on the land in rows, so as to admit the dung cart on each land, to manure for a succeeding crop of turnips.

On the 25th, the heads were brittle enough to be readily crushed with the foot; and on that account were considered ready for thrashing. They were, therefore, picked from the stalks, and carried to the centre of the field, at 3*d.* per bag of 6 bushels. They were fortunately secured by a large rick cloth from the rain, which fell in abundance next day.

August 27th. The whole crop of heads was thrashed on the spot in four hours, by a machine of 4 horse power; the seed (a sample of which is sent) was separated by coarse riddles, and afterwards perfectly cleaned by a sieve just coarse enough to permit the seed to pass through, while the dust was blown away by the wind fan. The seed weighed 13 cwt. which we expect to produce 5½ gallons of oil per cwt.



The straw being removed, and the dung spread and ploughed in, the field was sown with stone turnip seeds, between the first and seventh of September. They did very well, and having been fed off with sheep, the land has received a ploughing preparatory for a *fourth* crop of poppies, which will be sown in the middle of this month after another furrow.

We now request permission to make some additional observations, which we have not been able with convenience to interweave in the preceding narrative, and which may be necessary if the paper should at any time serve as a guide to a beginner in the poppy cultivation.

The soil on which our experiments were made, is a good loam on a sandy subsoil; it had been much exhausted by perpetual white crops and other bad husbandry, when it was prepared in the Autumn of 1818 for poppies; it was then under wheat stubble, and so completely occupied with the roots of couch grass, as to form a perfect mat.

In this state it was ridged up in furrows, merely deep enough to bottom the couch grass; each furrow was then pulled separately down with rakes, containing five 6 inch teeth, this brought the couch to the surface, from whence it was carted off in immense quantities; insuperable obstacles presenting themselves to burning it on the land.

The land now appeared perfectly clean, and after another ploughing, the greater part of it was sown without manure, with white poppy seed, which survived the succeeding winter. The annuals had been allowed to shed their seeds during many preceding years, and they now came up as thick as mustard or cress in the garden; amongst these the *alsine media* (chickweed), and the *Polygonum persicaria* (knot-grass), were pre-eminent; they were destroyed by the hoe in the Spring, but each succeeding ploughing excited

an equal abundance of successors into vegetation, until last year, when this number, though still very great, was sensibly diminished. These circumstances are mentioned, to show, that although foul land is a great obstacle to the cultivation of the poppy, yet it is not an insurmountable one.

The other portion of the field was sown in the following February, with a portion of the same seed, and had a liberal allowance of manure. The Winter poppies grew very slowly until the end of May, when they obtained a decided superiority, which they preserved to the last; adding another proof to many observed before, that poppies sown in the Autumn, without manure, are superior to those sown with that advantage in the Spring.

It should, however, be known that the *papaver somniferum* will not always bear the severity of our Winter: and that hares, where they abound, will certainly eat it during the Winter.

We have observed, that poppies are cut off rather by sharp winds than by still frost, however severe. As a protection, last Autumn we drilled turnips thickly in each interval at the time of sowing (Sept. 7th); these grew up much above the poppies, which have hitherto withstood the Winter. This, however, may be accounted for by the mildness of the season, without referring to the agency of the turnips; still the experiment certainly deserves to be repeated.—This piece measures 6 roods.

The manures employed were composts of night-soil and road drift, the dung of horses and of hogs, and street manure.

The scarificators should be attended to carefully; they ought to cut deep enough to make the juice flow from each incision; but if they penetrate the cavity of the

head, much mischief is done; a channel by no means desirable is formed for the opium, while the growth of the head is checked, and the seed exposed to ruin from the rain. The smaller poppies must be examined at the first operation after each scarifier. They should be squeezed betwixt the thumb and finger, and if the wounds are too deep, the air from within the head will escape, bubbling through the milky juice.

The knives must be kept very sharp; our's were ground every morning, and finished on the hone.

The receivers should have sharp edges, the more effectually to clear the knives.

It should have been remarked, that when the scraper follows the scarifier too quickly, a fresh exudation takes place. When this happens, the children scrape them again in the morning, whilst fresh work is provided them by the scarifiers. Warm days, and parts of the day, promote the exudation greatly.

No particular application has yet been discovered for poppy oil, excepting as a vehicle for the colours of artists. The oil cake we have given to pigs with great advantage; and have information of good success from stall-feeding cattle with it; the seed itself, perhaps, contains more nutriment in a given weight than any other vegetable production.

The capsule of the poppy, after producing opium, yields, by cold infusion, an extract, of which we send a specimen; eight grains of it are fully equal to one of opium. No considerable demand for it exists; an acre produced 80*lb.* of this extract.

Notwithstanding the apparent stubbornness of the poppy straw, it makes excellent manure, when well trodden in the yard, and laid in a compact head to ferment.

The quantity of opium consumed in this country, is supposed to amount to about 40 to 50,000*lbs.* exclusive of that which is exported. This quantity, our experiments have convinced us, could be easily raised in many parts of Great Britain, where good dry land, and a superfluous population happen to exist together. On the moderate calculation of 10*lbs.* per acre, that quantity would only require 4 or 5,000 acres of land, and 40 to 50,000 people.

As far as such a limited employment can go, a general cultivation of opium would certainly be beneficial by calling into action a description of persons not calculated for common agricultural labour, and that between hay-time and harvest. The duty of 8*s.* 8½*d.* on foreign opium, would secure a profit on opium consumed at home, as it must add at least 1*l.* per lb. to the price of the foreign.

Our experiments have taught us, that the opium season may be extended to six weeks and upwards, by one autumnal and two or three vernal sowings.

At present, scarcely any demand exists for British opium ; but the article has been introduced to the attention of the College of Physicians ; and should that learned body think proper to give it a place in the Pharmacopœia, the currency thereby stamped upon it, will soon bring it into use. We confidently expect, that the British will soon be sought for in preference to the foreign opium, and consequently bear a higher price. This opinion is founded on the numerous and highly favourable reports we have received from eminent medical practitioners ; and confirmed by the result of our own experiment of its effects ; having administered many pounds of it during the last three or four years.

To conclude, Sir, if the Society feels desirous to publish this paper, we shall be extremely ready to give more par-

ticular information, on any part which the Society may not consider sufficiently explained.

In consequence of being engaged in the cultivation of other medicinal plants, we have to regret our inability to offer the Society an account of the precise total of expense incurred last year by the cultivation of opium; we were not apprised of the Society's intentions until October. Where the expenses are stated, they may be relied upon as correct. We have omitted to state, that we calculated the deficiency in the crop, at a fourth part, and that we believe an acre may produce at a *maximum* upwards of 20 *lbs.* of opium.

We are, Sir,

&c. &c. &c.

JOHN COWLEY, *Member of the Royal College of Surgeons.*

WILLIAM STAINES, *Surgeon.*

A. Aikin, *Esq.*

*Sec. &c. &c.*

TABLE I.

Showing the daily PROGRESS and EXPENSE, in the  
Year 1820.

Days.	Number of Persons.	Quantity.			Expense.		
		<i>lb.</i>	<i>oz.</i>	<i>dr.</i>	<i>£.</i>	<i>s.</i>	<i>d.</i>
1820.							
July 19.	2 Women .....	—	4	4	—	2	—
20.	7 D° .....	—	9	—	—	7	—
	7 D° viz. { N° 1... — 2... — 3... — 4... — 5... — 6... — 7...	—	8	4	}	7	—
		—	5	8			
		—	5	12			
21.		—	5	12			
		—	5	8			
		—	3	14			
		—	—	12			
22.	11 D° .....	1	15	8	—	11	—
24.	10 D° .....	2	13	—	—	10	—
25.	11 D° .....	3	6	—	—	10	6
26.	11 D° .....	3	11	12	—	11	—
27.	11 D° .....	1	10	12	—	11	—
28.	4 D° .....	0	15	—	—	4	—
29.	4 D° .....	1	2	12	—	4	—
31.	4 D° .....	1	1	—	—	4	—
Aug. 1.	4 D° .....	0	11	4	—	4	—
2.	4 D° .....	1	—	8	—	4	—
		21	8	2	4	9	6

TABLE II.

Showing the daily PROGRESS and weekly EXPENSE in the  
Year 1821, with the general state of the Weather.

Days.	Weather.	Quantity.			Expense.		
		lb.	oz.	dr.	£.	s.	d.
1821.							
July 24.	Showery .....	5	1	—	—	—	—
25.	D° .....	9	—	—	—	—	—
26.	D° .....	11	—	—	—	—	—
27.	D° .....	14	—	—	—	—	—
28.	Fine all day .....	14	—	—	8	13	1½
30.	Showery .....	5	—	—	—	—	—
31.	Constant Showers ...	7	—	—	—	—	—
Aug. 1.	Fine .....	7	8	—	—	—	—
2.	Showery .....	4	12	—	—	—	—
3.	Hot and dry .....	8	—	—	—	—	—
4.	Fine .....	2	12	—	15	1	6½
6.	Tolerably d° .....	2	12	—	—	—	—
7.	Fine .....	4	8	—	—	—	—
8.	Rained hard all day...	—	—	—	—	—	—
9.	Showery .....	1	12	—	7	16	6½
		97	1	—	31	11	2½

SIR;

Winslow, April 15th, 1822.

IN reply to your letter, of the 16th ult. requesting “a particular account of the method of constructing the scarificator” employed by us, we transmit to you the following particulars :

Entirely unused, however, to describe mechanical operations, we rely on your pardon, if through our anxiety to be sufficiently particular, we risk the misfortune of becoming somewhat tedious ; we do so with the more confidence, from an impression that your memory will present

you with instances, in which descriptions of very simple operations, have been rendered perfectly unintelligible, by want of attention merely to minutiae.

We send you the only two instruments employed in the construction of scarificators, that are possessed of any peculiarity. The other requisites consist of a small step grind-stone (if with an apparatus for supplying water, much the better), a bench with a small vice affixed, and a light hammer.

With respect to the most proper kinds of wood, our experience only enables us to speak of three ; beech, mahogany and oak. Of these, beech is considerably the best ; having a mixed grain, it holds the blades with much tenacity : mahogany can be worked with more facility than beech, but wanting the transverse fibres of the latter, it is less tenacious of the steel : oak holds the blade with sufficient firmness, but the direction of its longitudinal fibres, is very uncertain and irregular ; hence it often happens, perhaps when the instrument is nearly finished, that a blade is thrown out of its proper course, and the whole by that means rendered useless ; this quality renders the employment of oak very objectionable.

It should be observed, that scarificators of one dimension, are sufficient for poppies of all sizes, the elasticity of their capsules permitting them to adapt themselves to the figures of the scarificators ; the latter should, however, be so constructed as to fit a poppy of an average size, in order to equalize the difficulty of accommodating them to the two extremes. The medium of size, we believe, is occupied by capsules two inches and a half in diameter ; on which account, the faces of our scarificators are formed of segments of a circle of that diameter.

The hafts are furnished by the carpenter, plain, at 1s. 6d.



per dozen; in this state they are supposed to be, at the commencement of our description of the construction of scarificators.

The first thing to be done is, to give to the part into which the steel teeth are subsequently to be inserted, a curve, corresponding with the arc of a circle, two inches and a half in diameter (see the left-hand figure 2, Plate I.): then, by means of a fine saw, made of watch-spring, make five equidistant cuts in the head of the handle, in a longitudinal direction, for the reception of the blades.

In order to save the great expense of forging and finishing a number of so small blades, we have been induced to employ broken watch-springs, for their formation, and have found them answer extremely well:—The manner of using them is as follows:—

A spring is to be brought to an edge by the grindstone, continually moving it, if the stone be dry; about one-sixth of an inch is then to be broken off with the pliers (assisted by firm pressure with the thumb) in an oblique direction, so as to leave the end of the spring possessed of an angle of forty-five degrees; the irregularities of the fracture are to be ground off, wetting the point frequently if the stone be dry, to avoid such an increase of temperature as would destroy the blue temper of the steel.

After the grindstone the hone must be used, to finish about as much of the point as is intended to project from the wood.

The handle is now to be fixed in the vice, and the spring (being previously wetted at the end with water) to be gently driven by means of a light hammer, into one of the cuts previously made by the saw, allowing the sharpened point to project about one-thirtieth part of an inch; the remainder of the spring is then to be broken off, by pressing

it with the thumb firmly down to the wood, close to which it should separate with an even fracture. The blades being thus successively fixed, the hammer must be employed to batter down the wood gently about them. The end and back being then applied slightly to the grindstone, the scarificator will be finished, and, notwithstanding the apparent slightness of the attachment, not one blade in a hundred will become loose.

If mahogany be used, a little sulphuric acid should be added to the water into which the blade is dipped previous to its insertion into the wood, and as soon as finished, must be placed with its head in a mixture of chalk and water, in order to neutralize the acid, which would otherwise attack the points and edges of the blades.

We should have stated, in our first communication, that two scarificators should be provided for each person; distributing the second supply, when the capsules become (as they will) somewhat tough; an industrious person, in a dry season, will even wear out three of these implements.

I am, Sir,

A. Aikin, Esq.

&c. &c. &c.

Sec, &c. &c.

WM. BLOW STAINES.

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#### CERTIFICATES.

Winslow, February 2nd, 1822.

I do hereby certify, that Messrs. J. Cowley, and W. B. Staines, obtained, in the year 1821, sixty pounds and one ounce, of solid opium, from the *papaver somniferum* raised

by them in this parish, and that the whole of it was in every respect equal to the specimen, No. 12.

I am, Sir,

*A. Aikin, Esq.*

&c. &c. &c.

*Sec., &c. &c.*

C. KIPLING.

SIR;

Harley-street, February 5, 1822.

I BEG leave to certify, that I have made frequent trials of the English opium, prepared by Messrs. Cowley and Staines, at Winslow, Bucks, and that I am convinced it will do every thing that we usually expect from the use of foreign opium.

I am, Sir,

&c. &c. &c,

J. LATHAM.

SIR;

2, Newman's-row, Lincoln's-Inn-fields.  
5th February, 1822.

I TRUST I am not departing from the regulations of the Society for the Encouragement of Arts, Manufactures, and Commerce, in requesting you to lay before it, my testimony in favour of the English opium cultivated by Mr. Cowley, of Winslow, in Buckinghamshire.

I have been in the habit of prescribing it in my own practice for upwards of twelve months, and am satisfied that its properties are, in every respect, equal to those possessed by foreign opium, and that its purity is greater than that of foreign opium.

It may likewise be necessary I should state, that I have furnished two persons, the one with opium, and the other with tincture of opium, who have, for some years, been in the constant habit of taking it in those forms. By the former (a labouring man), I have

been told, that he cannot distinguish any difference between the effects of it, and of foreign-opium; whilst the latter, a gentleman of considerable literary attainments, and whose papers on the subject of opium-eating, contained in the London Magazine, of September and October last, will show how far his opinion is entitled to attention, this gentleman has distinctly stated, that he has failed to produce the same effects with one hundred drops of the tincture, made from Turkey opium, as those which he had previously produced, by the same quantity of tincture made with Mr. Cowley's opium. In laying these facts before the Society, I consider I am but performing a duty.

I am, Sir,

*A. Aikin, Esq.*

&c. &c. &c.

*Sec. &c. &c.*

THO. CLARKE, *Surgeon, &c.*

28, Parker Row, Dockhead,  
November 5th, 1821.

GENTLEMEN;

I RECEIVED your communication respecting the British opium, but was prevented by professional engagements from giving you an earlier answer, which I should otherwise have cheerfully done.

I have employed scarcely any foreign opium these last six months, when I began with yours, excepting in physical prescriptions, and have used nearly the four pounds I received of you, in my practice.

Your inquiries as to the result of my experience of the medical properties of it, I feel enabled to answer with confidence, for the obvious importance of the subject has led me to a careful observation of its effects.

My opinion is, that your opium is in no respect inferior to the best Turkey opium. I consider it far superior to the

greater part imported. Its extraordinary purity must be, and is, very much in its favour; the foreign is evidently a very heterogeneous mass, perhaps partially from the slovenly mode of collecting it, and partially from adulteration, the comparison of different specimens will demonstrate that it is so in various and uncertain degrees; on the last account, I believe, the employment of your opium is likely to be most advantageous, being more uniform and certain. It is my opinion, however, that the sanction of the College of Physicians will be necessary, to give it the requisite degree of currency with the profession.

I perfectly agree with you respecting the national advantage likely to be derived from the extended cultivation of opium in this kingdom, for although I cannot pretend to extensive knowledge of the comparative advantages of foreign and domestic trade, I yet venture to suppose, that British capital can no where be better laid out than in the employment of British subjects, in a way peculiarly suited to such as are too old, too young, or too weak, for common agricultural labour.

I remain,

&c. &c. &c.

Z. DUNKIN.

P.S. If these few observations can be any way serviceable to you, use them at your pleasure.

Brackley, December 1st, 1821.

I HAVE tried the opium prepared by Mr. Cowley, of Winslow, and find it in effect, equal to the finest Turkey.

FREDERICK GEE.

13, Bedford Row, February 5th, 1822.

I BEG leave to state to the Society of Arts, &c., that I have both ordered the use of Mr. Cowley's opium in my own practice, and recommended its employment to others; and that both myself and friends have found it *at the very least*, equal in efficacy to the opium met with in the shops. Indeed, we have rather thought it to possess superior power to the common Turkey opium.

DAVID UWINS, M.D.

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Nº III.

PRESERVING TURNIPS DURING THE WINTER.

*The large GOLD MEDAL, the premium offered, was this Session presented to Messrs. COWLEY and STAINES, Surgeons, Winslow, Bucks, for their successful method of preserving the ROOTS OF TURNIPS in a state fit for feeding cattle therewith, during the months of February, March, and April. The following communication has been received from the Candidates, on the subject.*

SIR;

Winslow,  
April 27th, 1822.

THE purport of the following paper is, to communicate to you, for the consideration of the Society of Arts, a method we have successfully employed for the preservation of turnips during the last Winter; in consequence of

which, we request permission to offer ourselves as candidates for the Society's premium, No. 35, for the "Preservation of Vegetable Produce."

The two fields in which our turnips were sown, measured (as will be seen by Mr. King's survey) four acres and upwards, exclusive of fences, &c. The soil in both is a dry loam, and was in good condition, although not manured for the turnips; two ploughings only were allowed, one in the preceding Autumn, the other in the Spring.

Between the 10th and 15th of last May, the seed was deposited in drills 21 inches apart, and we think about one deep. Very nearly ten pounds of seed were used, with hopes that enough plants might escape the turnip-fly. The seed came up very favourably, in great abundance, yet the fly, which soon commenced its ravages, destroyed so many, that it was necessary to procure plants from other quarters, before all the vacancies could be filled by transplanting; this was performed between the 3rd and 7th of July, with favourable showers, but was rendered partly abortive by dry weather immediately succeeding the last day of planting, so that, eventually, the crop was considerably imperfect.

On the 10th of November, we began pulling the turnips which were all carted home before the end of that month, and the land immediately sown with wheat, which now promises extremely well. The crop was removed thus early, in order to demonstrate that our plan would permit wheat to succeed the turnips, and with the hope of influencing the Society in its favour on that account.

A man and two boys were next employed to cut off the tops, leaving the roots undisturbed, with particular instructions not to remove the crown, or any part of the

neck, even although the latter should be of considerable length. This caution we considered highly important, because in all cases where the decay of turnips, carrots, beets, or mangel wurtzel, has fallen under our observation, such roots as were destitute of crowns, have soonest and most frequently fallen into decay. Now, the causes of this propensity to decay, which such mutilated roots do certainly possess, appeared to us deserving of investigation; we have accordingly bestowed some attention upon the subject, and beg leave to offer the result of our inquiries.

We have imbibed an opinion that wounds in any part of bulbous roots, in some measure increase their tendency to decay; but their influence is very slow and uncertain compared with such as remove the crown. At the crown the leaves are united to the bulb, and, somewhat within the bark of the latter, future separation will take place at a point in no way influenced by the length of pedicle left on cutting off the leaves. These points may be seen distinctly in the form of small cavities, on examining a turnip whose crown is lengthened into a neck. The leaves of the turnip are annual, although the bulb is biennial; the first year's crop of leaves are shed during the first Summer and succeeding Winter; in the next Spring, if in the field, or immediately, if stacked or housed, one fresh shoot or more will be produced in most of the eyes or cavities, consisting of many leaves, precisely in a similar manner to the production of buds on trees after the leaves of the preceding season.

The production of this shoot is, we think, a great preventative of decay in the root, for the latter, being still in a living state, requires the function of respiration to be performed by its bark and leaves; this function, the latter,



assisted by their youth, will carry on to a considerable extent. On this account it is, that we insist so much on the necessity of preserving the crown, whose agency appears to us essential, as it contains the rudiments of those buds which we consider so efficacious as organs of respiration.

To proceed with the description :—After the leaves had been removed, as many turnips were thrown together as would readily lie upon a circle 4 yards in diameter; *yealms* of wheat straw were made, similar to such as are used for thatching, but longer, thicker, and formed with less precision; four tall stakes were then driven into the earth, each a yard from the heap, so as to form a square, each side of which would measure six yards.

*Two courses* of *yealms* were next placed on the earth, so as to inclose the quadrangle indicated by the stakes, and in such a situation, that a line drawn from one stake to the next, would divide them transversely into two equal portions. Large turnips being selected for the sake of expedition, a single row of them was placed along the middle of the *yealms*, in a line with the stakes, which served as guides to the proper position of the row; the *upper* course of *yealms* was next turned up over the turnips, a boy being employed to place a second row of smaller turnips immediately within the first, in order to press down and confine the ends of the *yealms*; turnips having been thrown in by the basket-ful, until the new work had a slight and regular descent towards the original heap: two more courses of *yealms* were laid on, and treated as the first.

This process was continued until about two thirds of the turnips had been disposed of; the outside, or wall, was then perpendicular, and possessed so much firmness, that a man could walk round the extreme edge without dis-

composing it in the least, so that it might have been raised in that direction to an indefinite height.

With the remaining third of the turnips, the top of the stack was brought into a pyramidal form, by making each succeeding course incline gradually towards the centre, until the top was about four feet wide, when it was brought to a point with the refuse straw, and surmounted with a flat stone. Each *under* course of yealms having been left undisturbed, they formed a thatch, as neat and impervious as the one usually placed upon barns, &c. Had the Winter even proved very severe, the thick and close coat of straw which inclosed the turnips, would, we are persuaded, have afforded them abundant security.

Between the 5th and 10th of February, we purchased six barren cows to consume the turnips, the number was, however, soon reduced to five, by an accidental death; these have been fed with the turnips to the present day, excepting two, one of which was sold on the 5th instant, the other on the 16th instant; both ate turnips until sold.

On re-perusing, in March, the Society's conditions, the feeding of sheep appeared to be an essential one; two wethers were therefore added to the feeding stock, in March.

The stack was opened on February the 6th, when the contents were found to be perfectly sound; and, although the turnips were as wet as possible when stacked, the earth upon them was then perfectly dry; this, perhaps, may account for their growing so little, which the peculiar mildness of the season, and the early period of stacking, had left us little room to expect; this supposition is confirmed by the circumstance of the lowest stratum being considerably grown, having shoots, perhaps, six inches high; whilst the other strata had, in general, merely little

buds, which have scarcely yet grown into shoots two inches long. These facts show the impropriety of stacking on the wet earth, which should be covered with straw or brushwood.

The cows improved rapidly on the turnips, they ate, when accustomed to them, from 2 to  $2\frac{1}{2}$  bushels each, per day; the roots were cut into convenient pieces, scraping such as happened to have earth adhering to them. The sheep also improved a good deal, but being put up so late, and that, too, in a very lean condition, some grass will be required to finish them for the butcher.

From the irregularities of our crop, we could not hope to state the average to the Society with the requisite accuracy, without measuring the whole produce; this was found to amount to 986 bushels, weighing 60 lbs. each, and thus affording an average of 1,380 lbs. to the 16 perches. The expense was as follows:—

	<i>s.</i>	<i>d.</i>
Two men, 1 day each . . . . .	2	6
Two boys, do. do. . . . .	0	8
	<hr/>	<hr/>
	3	2
	<hr/>	<hr/>

The expense of pulling and topping was more than repaid by the value of the tops for pigs; 17 cwt. of straw were used, but it received no injury, and was employed to litter the cows.

Although not enjoined by the Society's conditions, we have sent the last remnant of our stack, hoping it will corroborate our statement of its soundness.

JOHN COWLEY.

WILLIAM STAINES.

## CERTIFICATES.

Whaddon Hall, April 27th, 1822.

THIS certifies, that I inspected Messrs. Cowley and Staines's, stack of turnips, which was constructed according to the preceding description; and saw the turnips as lately as the first week in April, when they were perfectly sound, and in every respect fit for supporting sheep and neat cattle.

W. SELBY LOWNDES.

Winslow, April 27th, 1822.

THIS is to certify, that, in November last, I measured Messrs. Cowley and Staines's turnips, and found the quantity of land to be 4 acres, 1 rood, 3 perches, exclusive of fences. I have also positive knowledge that the whole crop was carted home before the end of that month.

JOHN KING, *Land Surveyor*.

Winslow, April 27th, 1822.

THIS is to certify, that in the first week in February last, I purchased for Messrs. Cowley and Staines, six beasts, and afterwards, two sheep; which, to my knowledge, have been fed upon turnips preserved in a stack, built according to the before-written plan; and that the said beast and sheep (excepting a heifer, which died accidentally), have constantly been thriving, and going on well, until the present day, respectively, as they have been sold.

GEORGE MAYDON, *Butcher*.

N<sup>o</sup> IV.

## HAY BORER.



*The Large SILVER MEDAL was this Session presented to Mr. ARTHUR BIDDLE, of Playford, near Ipswich, for an INSTRUMENT FOR BORING HAY-STACKS. The following Communication has been received from the Candidate on the subject, and the Instrument itself is in the Repository of the Society.*

SIR;

Playford, Suffolk, May 1822.

I HAVE taken the liberty of sending, for the inspection of the Society, a machine invented by me in 1815, for the purpose of boring haystacks, either in a vertical, or in any other direction, in order to give vent to the heat, when they are in danger of firing, or for drawing samples when they are offered for sale. After trying several plans without the desired success, I invented the instrument accompanying this communication, and allowed a maker of edge-tools in this village, Wm. Wright, to make what advantage he could of the invention. He accordingly made several instruments, till his death, which happened two years ago, and disposed of them in this neighbourhood,

and in Essex, where they have given satisfaction, as appears from the annexed certificates.

I am, Sir,

*A. Aikin, Esq.*

&c. &c. &c.

*Sec. &c. &c.*

ARTHUR BIDDLE.

### CERTIFICATES.

SIR ;

Culpho-hall, near Ipswich, Suffolk,  
March 26th, 1822.

FOR a great number of years past, a great deal of hay, and clover, stover, &c., &c., have taken much hurt, by over-heating, and recourse has been had to methods for letting out the heat from the stack, such as drawing a sack up the middle of the stack ; laying a number of wood-faggots across, &c. &c., in order to prevent its turning black (which is often the case), and so, entirely spoiled. I have seen a stack so overheated, as to be good for very little, excepting the two ends of the stack. About seven years ago, Mr. Biddle of Playford, near Ipswich, Suffolk, invented an instrument for boring holes, in any direction, through any stack, or perpendicular, according as it was wanted or thought to be proper.

In the month of July, 1815, I sent for one of these instruments to a Mr. Wright, a blacksmith, whom Mr. Biddle employed to make them (and as I have always understood, Wright had permission from Mr. Biddle to make, and take the profit of them, as long as Wright lived). With this instrument, I found I could bore through the stack in any direction, in a few minutes (a stack of about fifteen tons) ; which I found of great use and benefit, to preserve the stack from over-heating ; and

I am fully persuaded that many stacks, which have been over-heated, and literally spoiled, if recourse had been had to Mr. Biddle's hay-borer, might have been excellent hay. I only speak of circumstances that have come under my own notice, and therefore, can vouch for the truth of what is here communicated, and for the utility of the instrument.

I am, Sir,

*A. Aikin, Esq.,*  
*Sec., &c. &c.*

&c. &c. &c.

JOHN THOMPSON.

CERTIFICATES to the same effect as the preceding, were received from Mr. J. P. Meadows, of Berherst House, Witnesham, Suffolk; Mr. Richard, and Mr. Robert Ashford, of Witnesham Hall; Mr. T. Flory, and Mr. Charles Poppy, also of Witnesham; and Mr. J. Bark, of Milton, near Peterborough.

The Agricultural Committee of the Society of Arts, also had an experiment performed under their inspection, on the premises of Mr. Rhodes, Tottenham-court-road, which afforded a very satisfactory result.

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*Description of the Instrument.*—Plate II.

FIGS. 1, and 2, represent the Borer, one-sixth of the real size: it may be compared to a solid cork-screw, only that the blade is wrapped round the rod, and does not form a part of it. The rod from *a*, to its point *b*, is made round and taper. The blade at its lower extremity is formed into an eye, which is secured to the rod by means of the screw *c*; from this point the fin, or cutting edge,

gradually increases in width, and is wrapped round the rod, at equal intervals, to the point *a*, where is formed a square hole, for the rod to pass through, as shown fig. 3, and in which it is secured by the screw *a*, fig. 2; the rod being in this part made square to fit the hole. From *a* to *d* the cutting edge is broad, and nearly at right angles with the rod; the part *d e*, is turned up, nearly at right angles to the preceding, and is curved, as if it were cut out of a cylinder, so that every part is equally distant from the axis. This part of the cutter must necessarily be longer than the distance between the spirals, otherwise the cuts would not be united; the edge also is made to slope backwards, as shown *d e*, fig. 5, in consequence of which form, it gives a drawing cut, and thus divides the hay with great facility.

The rod is cylindrical, about twelve feet long, and three-fourths of an inch thick; it is turned by a cross-handle, *ff*, fig. 6, and may be secured at different distances, according as the instrument advances into the stack, by means of the screw *g*, taking into the holes *h h*, which are sunk to the depth of about a quarter of an inch. In the end of the rod is a square hole or socket, for the purpose of fastening on another length of rod, the projecting end of which fits into the socket, and is there secured by a screw.

The other part of the apparatus is the drawing screw, *i k*, fig. 1., the diameter of which is nearly equal to that of the hole made by the cutter, and by means of it the plug of hay, detached by the knife, is drawn out.

Figs. 3 and 4, represent the cutter as seen parallel to the axis of the rod, and looking from or towards its point.



*Directions for using the Instrument.*

FIRST cut away the loose hay, where the borer is intended to be applied, then insert the point of the borer, and by means of the cross handle turn it round, till the stack is pierced either quite through, or to a sufficient depth; then withdraw the cutter, and by means of the drawing screw repeatedly applied, take out the plug of hay which has been detached. If, however, the hay be in a moist, heating state, it will occasionally coil round the cutter in proportion as it is pierced, and impede its action. In such cases, the drawing screw must be slipped over the rod of the cutter, as shown fig. 1., and must be applied from time to time, to draw out the hay, in proportion as it is detached from the mass.